

## MOP

## FIELD OF THE INVENTION

[0001] This invention pertains to mops and more specifically to a hinge mop.

## BACKGROUND OF THE INVENTION

[0002] Mops are used to clean floors and pick up spills. One type of mop is a sponge mop. Sponge mops typically have some type of mechanism to squeeze the liquid from the mop element. One type of sponge mop is a roller mop which utilizes a series of rollers to squeeze the liquid from the mop element. An example of a roller mop is shown in U.S. Patent 5,097,561. Another type of sponge mop is a butterfly mop in which the mop folds along a central axis.

[0003] Another type of sponge mop is a hinge mop which utilizes a hinged portion of the mop element support to squeeze the fluid from the mop element. The difficulty in using such a hinge mop is that the user must bend down to squeeze the mop in order to assure that the liquid will be expelled adequately. In addition, the wringing operation can cause the user's hands to become wet and/or soiled.

[0004] There is a need for a flat mop which does not require the user to bend over to squeeze the liquid from the mop and get his hands wet. There is also a need for a flat mop which is easier and less expensive to manufacture and performs better than prior mops.

[0005] These and other advantages of the invention, as well as additional inventive features, will be apparent from the description of the invention provided herein.

## BRIEF SUMMARY OF THE INVENTION

[0006] The invention provides a mop which includes a handle, a pusher, a front cam, a rear cam, a mop element support and a mop element. The pusher may include a front arm and a rear arm with cam-engaging surfaces. The mop element support has a center portion, a front portion and a rear portion. The front portion is attached to the center portion by a front living hinge and the rear portion is attached to the center portion by a rear living hinge. The front portion folds along the front living hinge and the rear portion folds along the rear living hinge when the mop is in the closed position.

[0007] When the user wishes to expel liquid from the mop, the user would grasp the handle with one hand and the pusher with the other hand. The user would then move the pusher along the longitudinal axis of the shaft. As the user moves the pusher relative to the shaft, the pusher would act upon the front cam and the rear cam. The front cam and the rear cams would begin to rotate and cause the rear portion of the mop element support to fold along the rear living hinge and the front portion of the mop element support to fold along the front living hinge. As the mop element support was being moved forward, liquid would then be squeezed from the mop element as the front and rear mop element supports came closer together.

[0008] After the mop element has been squeezed, the user would then move the pusher in the opposite direction along the shaft. The pusher would engage the front and rear cams causing the front and rear portions of the mop element support to unfold along the living hinges.

## BRIEF DESCRIPTION OF THE DRAWINGS

- [0009] FIG. 1 is a front perspective view of the mop.
- [0010] FIG. 2 is an exploded view of the mop.
- [0011] FIG. 3 is another exploded view of the mop.
- [0012] FIG. 4 is a side view of the mop.
- [0013] FIG. 5 is a front top perspective view of the mop.
- [0014] FIG. 6 is a rear view of the mop.
- [0015] FIG. 7 is a front view of the mop.
- [0016] FIG. 8 is a cross-sectional view taken along line 8-8 in FIG. 7.
- [0017] FIG. 9 is a cross-sectional view taken along line 9-9 in FIG. 8.
- [0018] FIG. 10 is a cross-sectional view similar to FIG. 8 showing the mop in a partially closed position.
- [0019] FIG. 11 is a cross-sectional view similar to FIG. 8 showing the mop in the closed position.
- [0020] FIG. 12 is a perspective view of another embodiment of the mop in the open position.
- [0021] FIG. 13 is a perspective view of the embodiment shown in FIG. 11 in the closed position.

## DESCRIPTION OF THE INVENTION

[0022] Referring to FIGS. 1-3, the mop 100 includes a handle 102, a pusher 104, a boss 106, a front cam 108, a rear cam 110, a mop element support 112 and a mop element 114.

Referring to FIG. 1, the mop is in the mopping position wherein the mop element 114 is in an open position. When the user wishes to squeeze liquid from the mop, the mop is moved to the closed position wherein the mop element 114 is squeezed to eliminate the liquid from the mop element as shown in FIG. 11. The handle 102 lies along a longitudinal axis 116 of the mop and the mop element support 112 lies along a transverse axis 118 of the mop.

[0023] The handle 102 may include a tubular shaft 120 with a plastic cap 122 at one end of the shaft and a threaded end cap 124 at the other end of the shaft. In this embodiment, the shaft 120 is made of tubular metal and the caps 122, 124 are made of plastic. In other embodiments, the shaft and caps may be unitary and may be made of other materials, such as plastic or wood.

[0024] Referring to FIGS. 1 and 3, the pusher 104 may include a pusher grip 126 and a pusher yoke 128. The pusher grip 126 is attached to the pusher yoke 128. In this embodiment, the pusher grip 126 includes two clips 130 which engage two slots 132 in the pusher yoke 128. In other embodiments, the pusher grip may be attached to the pusher yoke by other techniques, such as, a fastener, an adhesive, fusion, welding or friction. In other embodiments, the pusher grip 104 may be unitary with the pusher yoke 128. The pusher grip 126 may include an overmolding material 133. The overmolding material 133 may improve the user's ability to grip the pusher grip and also provide cushioning for the user's hand.

[0025] The handle 102 is inserted inside the pusher 104. The handle 102 is then attached to the boss 106. In this

embodiment, the threads 134 on the end cap 124 engage the threads 136 in the boss 106 as shown in FIG. 8. In other embodiments, the handle may be attached to the boss by other techniques, such as an adhesive, a fastener, welding or friction.

[0026] Referring to FIGS. 3 and 4, the pusher 104 may include a front arm 140 and a rear arm 142. The front arm 140 may include a cam-engaging surface 144 and the rear arm 142 may include a cam-engaging surface 146. The pusher 104 may include cam openings 148, 150 in the arms. The cam openings 148, 150 permit the front cam 110 and the rear cam 112 to rotate as shown in FIG. 10.

[0027] The boss 106 may include an attachment portion to attach the boss 106 to the mop element support 112. Referring to FIG. 3, in this embodiment, the attachment portion 160 includes two arms 162, 164 and two clips 166, 168 on the end of the arms. The clips 166, 168 will engage the mop element support 114. In other embodiments, other attachment techniques may be used, such as, fasteners, adhesive, welding or friction.

[0028] Referring to FIG. 4, the boss 106 may include a stop portion 180 to limit the movement of the pusher 104 during the squeezing process and to maintain the assembly in a substantially planar condition by engaging the rear cam 112. Referring to FIGS. 4 and 6, in this embodiment, the stop portion 180 extends outward and is located on the rear of the boss 106. As shown in FIG. 11, the stop portion 180 will engage the stop portion 182 on the pusher to limit the movement of the pusher. In other embodiments, the stop portion may have another configuration and may be located in a different position.

[0029] Referring to FIGS. 3, 4 and 8, the mop 100 may include the front cam 108 and the rear cam 110 which assist in

opening and closing the mop. The front cam 108 has a central portion 190, a distal portion 192, and a stop portion 194. The distal portion 192 is disposed at an angle of approximately 130° to the central portion 190. The stop portion 194 is disposed at an angle of approximately 90° to the central portion 190. The front cam 108 has a pusher engaging surface 196 which engages the pusher arm 140. Referring to FIG. 8, the rear cam 112 has a center portion 202, a lower arm 204, and an upper arm 206. The lower arm 204 is disposed at an angle of approximately 90° to the center portion 202 and the upper arm 206 is disposed at an angle of approximately 90° to the center portion 202. The rear cam 112 has a pusher engaging surface 208 which engages the pusher arm 142.

[0030] The front cam 108 and the rear cam 110 may be attached to the mop element support 112 as shown in FIG. 2. In this embodiment as shown in FIG. 8, the cams 108, 110 may include attachment portions. The attachment portion 220 for the front cam 108 includes a clip 222 which engages a slot 224 on the front portion of the mop element support 112. The front cam 108 may also include a protrusion 226 which engages the front portion of the mop element support 112. The attachment portion 230 for the rear cam 110 includes a clip 232 which engages a slot 234 on the rear portion of the mop element support 112. The rear cam 110 may also include a protrusion 236 which engages the rear portion of the mop element support 112. In other embodiments, other attachment techniques may be used, such as fasteners, adhesive, welding or friction. In yet other embodiments, the front cam and the rear cam may be unitary with the mop element support.

[0031] Referring to FIGS. 2 and 4, the mop element support 112 has a center portion 240, a front portion 242 and a rear portion 244. The front portion 242 is attached to the center portion 240 by a front living hinge 246. The rear portion 244 is attached to the center portion 240 by a rear living

hinge 248. Referring to FIG. 10, the front portion 242 folds along the front living hinge 246 when the mop is in the closed position. Similarly, the rear portion 244 folds along the rear living hinge 248 when the mop is in the closed position.

[0032] The mop element support 112 may include an attachment portion for the boss 108. In this embodiment as shown in FIG. 3, the attachment portion 252 includes two slots 254, 256 in the center portion 240 of the mop element support. The two clips 166, 168 on the boss will engage the two slots 254, 256. In other embodiments, other attachment techniques may be used, such as, fasteners, adhesive, welding or friction.

[0033] Referring to FIG. 1, the mop element support 112 may include an attachment portion for the mop element 114. In this embodiment, the attachment portion 260 includes four attachment apertures 262, 264, 266, 268. The apertures 262, 264, 266, 268 are located near the ends of the mop element support 112. In other embodiments, the attachment apertures may be located in other positions and may be more or less than four attachment apertures.

[0034] Referring to FIG. 1, the mop element support 112 may also include fluid openings to allow fluid to escape when the mop element is squeezed. In this embodiment, two fluid openings 270, 272 are located in the center portion 240 of the mop element support. In other embodiments, the number of openings may be more or less than two and the openings may be located in other positions on the mop element support.

[0035] The mop element support 112 may also include an attachment portion for a scrubbing device, such as a scrub brush. In this embodiment, as shown in FIG. 1, the mop element support 112 has an attachment portion 280 which includes two slots 282, 284. The slots 282, 284 are located

on the front portion 242 of the mop element support. As shown in FIG. 2, the mop may include a scrub brush 286. The scrub brush 286 may include protrusions to engage the slots 282, 284. In other embodiments, the number of slots and protrusions may be more or less than two and the slots may be located in other positions on the mop element support. In addition, other embodiments may use other attachment systems for attaching the scrubbing device to the mop element support, such as, fasteners, adhesive, welding, or friction.

[0036] Referring to FIG. 2, the mop element 114 may include a sponge 290, sponge holders 292, 294 and a scrubber strip 296. The sponge holders 292, 294 are attached to the sponge 290. The sponge holders may be attached to the sponge by fusing, welding or an adhesive. The sponge holder 292 may include an attachment portion 300. In this embodiment, the sponge holder 292 includes attachment clips 302, 304 which are located at the ends of the sponge holder 292. Similarly, the sponge holder 294 may include attachment clips 306, 308. In other embodiments, the attachment clips may be located in other positions. In addition, other embodiments may use other attachment systems for attaching the mop element to the mop support, such as, a bolt and wingnut, hook and loop elements, or post and fastener .

[0037] When the user wishes to expel liquid from the mop 100, the user would grasp the shaft 120 with one hand and grasp the pusher grip 126 with the other hand. The mop would be in the open position shown in FIGS. 1 and 8. The user would then move the pusher 104 along the longitudinal axis 116 of the shaft 120 toward the mop element 114. As the user moves the pusher 104 relative to the shaft 102, the pusher yoke 128 would act upon the front cam 108 and the rear cam 110. Specifically, the cam-engaging surfaces 144, 146 on the yoke would engage the pusher engaging surfaces 196, 208 on the front and rear cams. As the cam-engaging surfaces on the pusher yoke move along the pusher engaging surfaces on the

front and rear cams, the rear cam 110 would begin to rotate and cause the rear portion 244 of the mop element support to fold along the rear living hinge 248. As the pusher 104 is moved further along the longitudinal axis 116 toward the mop element support 112, the cam-engaging surface 144 on the pusher yoke engages the front portion 192 of the front cam 108 as shown in FIG. 10. The cam 108 begins to rotate and cause the front portion 242 of the mop element support to fold along the front living hinge 246.

[0038] As the pusher 104 is moved further towards the mop element support, the cams 108, 110 further rotate causing the mop element support to fold along the living hinges 246, 248. As the mop element support is being folded, liquid is squeezed from the mop element 114 as the front and rear portions 242, 244 of the mop element support come closer together as shown in FIG. 11. The forward movement of the pusher 104 towards the mop element support 112 is stopped when the boss stop 180 engages the pusher stop 182 as shown in FIG. 11.

[0039] After the mop element has been squeezed, the user would then move the pusher 104 in the opposite direction along the shaft 120. The cam-engaging surfaces 144, 146 on the pusher engage the pusher engaging surfaces on the front and rear cams 108, 110. The cams rotate causing the front and rear portions of the mop element support 114 to unfold along the living hinges 246, 248. As the pusher 104 is moved further along the shaft 120 towards the opposite end of the handle, the movement of the pusher yoke is stopped when the engaging surface 144 on the front arm of the pusher engages the stop portion 194 on the front cam as shown in FIG. 8.

[0040] Referring to FIG. 2, if the user needs to replace the mop element 114, the user may remove the element by moving the clips 302, 304, 306, 308 so that the clips pass through the slots 260, 262, 264, 268 in the mop element support. The

user may attach a new mop element to the mop element support by pushing the clips 302, 304, 306, 308 into the slots 260, 262, 264, 268 so that the clips engage the mop element support.

[0041] Another embodiment of the mop is shown in FIGS. 12 and 13. This mop 1000 is similar to the embodiment shown in FIGS. 1-11. However, in this embodiment, the boss 1106 includes two arms 1107 which engage the pusher yoke 1128 to limit the movement of the pusher yoke during the closing and opening of the mop 1000. Referring to FIG. 12, the arms 1107 engage a stop 1129 on the pusher yoke to prevent the forward movement of the shaft 1120 when the user is attempting to open the mop element after squeezing the mop element. As shown in FIG. 13, the arms 1107 engage the stop 1131 on the pusher yoke 1128 when the mop is in the closed position in order to stop the movement of the pusher yoke relative to the mop element support 1112.

[0042] Another difference between this embodiment of the mop 1000 and the embodiment shown in FIGS. 1-11 is that the pusher grip 1126 is integral with the pusher yoke 1128. Specifically, the pusher yoke and pusher grip are molded as one piece as shown in FIG. 11.

[0043] Another difference between this embodiment of the mop 1000 and the embodiment shown in FIGS. 1-11 is that the pusher-engaging surfaces are pins 1133, 1135. The pins 1133, 1135 are separately molded and attached to the pusher yoke 1128 as shown in FIG. 12.

[0044] Preferably, the front and rear cams are made from a plastic material, preferably from an acetal resin, and even more preferably from Delrin® 100P acetal resin made by DuPont Engineering Polymers of Wilmington, Delaware. The boss is also preferably made from a plastic material, preferably from an acetal resin, and even more preferably from Delrin® 100P

acetal resin made by DuPont Engineering Polymers of Wilmington, Delaware. The mop element is preferably made from polypropylene.

[0045] All references, including publications, patent applications, and patents, cited herein are hereby incorporated by reference to the same extent as if each reference were individually and specifically indicated to be incorporated by reference and were set forth in its entirety herein.

[0046] The use of the terms "a" and "an" and "the" and similar referents in the context of describing the invention (especially in the context of the following claims) are to be construed to cover both the singular and the plural, unless otherwise indicated herein or clearly contradicted by context. The terms "comprising," "having," "including," and "containing" are to be construed as open-ended terms (i.e., meaning "including, but not limited to,") unless otherwise noted. Recitation of ranges of values herein are merely intended to serve as a shorthand method of referring individually to each separate value falling within the range, unless otherwise indicated herein, and each separate value is incorporated into the specification as if it were individually recited herein. All methods described herein can be performed in any suitable order unless otherwise indicated herein or otherwise clearly contradicted by context. The use of any and all examples, or exemplary language (e.g., "such as") provided herein, is intended merely to better illuminate the invention and does not pose a limitation on the scope of the invention unless otherwise claimed. No language in the specification should be construed as indicating any non-claimed element as essential to the practice of the invention.

[0047] Preferred embodiments of this invention are described herein, including the best mode known to the inventors for

carrying out the invention. Variations of those preferred embodiments may become apparent to those of ordinary skill in the art upon reading the foregoing description. The inventors expect skilled artisans to employ such variations as appropriate, and the inventors intend for the invention to be practiced otherwise than as specifically described herein. Accordingly, this invention includes all modifications and equivalents of the subject matter recited in the claims appended hereto as permitted by applicable law. Moreover, any combination of the above-described elements in all possible variations thereof is encompassed by the invention unless otherwise indicated herein or otherwise clearly contradicted by context.